"Clean" copy of amended English Translation, which shows changes made both to the specification and the claims and is recommended for use by the Office in prosecution and for printing.

Patent Claims for "Communication" and "Multi-Link Controller"

1. Electrical drive system for the synchronised adjustment of a plurality of rotatable axles or further, also linearly movable functional parts (3) of devices and machines, in particular printing machines, in terms of their position, speed or acceleration, with a plurality of drive units (DRC) controlled using computer assistance, which are connected to one or more functional parts (3) for their adjustment, and with a plurality of drive networks, which each have a plurality of the drive units (DRC) as network nodes and are allocated to some or a group of the functional parts (3), wherein, inside at least one of the drive networks, its nodes or drive units (DRC) are arranged in accordance with the master/slave principle and are respectively connected to one another in a ring structure through communication channels (1) and/or a communication system, and at least one node (SDC) of a drive network is coupled in a ring structure with one node (SDC) of another drive network, likewise in accordance with the master/slave principle, through inter-communication channels (1) and/or an inter-communication system or network.

2. Electrical drive system for the synchronised adjustment of a plurality of rotatable axles or further, also linearly movable functional parts (3) of devices and machines, in particular printing machines, in terms of their position, speed or acceleration, with a plurality of drive units (DRC) controlled using computer assistance, which are connected to one or more functional parts (3) for their adjustment, and with a plurality of drive networks, which each have a plurality of the drive units (DRC) as network nodes and are allocated to some or a group of the

functional parts (3), wherein, inside at least one of the drive networks, its nodes or drive units (DRC) are communicatively coupled with one another, and with a plurality of inter-communication networks, whose nodes (SDC) are also communicatively coupled with one another and simultaneously belong to different drive networks, and furthermore with a multi-link controller (MLC), which is provided with communication components (SIM), each as respective nodes of the intercommunication networks, and is designed using program and/or circuit technology for their management, connection, interlinking and/or coupling with one another.

3. Drive system according to Claim 2, characterised in that the drive and/or intercommunication networks are arranged using a preferably serial ring structure and/or are organised in accordance with the master/slave principle.

4. Drive system according to Claim 3, characterised in that the communication component (SIM) is designed in the scope of the master/slave principle as a communication master of the respective intercommunication network.

5. Drive system according to Claim 2, 3 or 4, characterised in that the communication components (SIM) are produced with serial interfaces (SIM) and are controlled by at least one processor (DSP).

6. Drive system according to one of Claims 2 to 5, characterised in that the communication component (SIM) is designed, interlinked or provided with functions of a communication manager (COM_MANAGER) preferably without undertaking direct drive functions.

7. Drive system according to one of Claims 2 to 6, characterised in that the plurality of intercommunication networks are arranged according to a star structure with the multi-link controller (MLC) as the star centre.

8. Drive system according to one of Claims 2 to 7, characterised in that at least one intercommunication network is designed for data transmission synchronously with a clock of the multi-link controller (MLC).

9. Drive system according to one of Claims 2 to 8, characterised in that, in at least one of the intercommunication networks, one or more of the nodes are configured using program and/or circuit technology as communication masters (M1, M2, M3) and/or master computers for other intercommunication networks, and their communication control and/or command signals are delivered to the other intercommunication networks by the multi-link controller (MLC), optionally after filtering or other processing.

10. Drive system according to one of the preceding claims, characterised by a design, using program and/or circuit technology, such that the setpoint position, speed and/or acceleration values are distributed, optionally with associated control and status information, to one or more of the drive networks via the inter-communication system or network.

11. Drive system according to Claim 10, characterised in that the control information contains logical allocation of one or more drive units (DRC) to one of the drive networks and/or intercommunication networks.

12. Drive system according to one of Claims 2 to 11, characterised by a design, using program and/or circuit technology, of the multi-link controller (MLC) such that an command and/or data transfer that fully or partially influences or controls the intercommunication networks takes place via it.

13. Drive system according to Claim 12, characterised by a design, using program and/or circuit technology, of the multi-link controller (MLC) such that all information for the allocation of one of the drive units (DRC) to a respective drive network is transferred via it to each intercommunication network.

14. Drive system according to Claim 13, wherein at least a plurality of the drive networks are designed, using program and/or circuit technology, in accordance with the master/slave principle, respectively with a communication master (SDC) which a forms a node of an intercommunication network, and the multi-link controller (MLC) is designed, using program and/or circuit technology, in such a way that all drive units (DRC) of this intercommunication network are each respectively allocated via it to one of the communication masters (SDC).

15. Drive system according to one of Claims 2 to 14, characterised in that a node (SDC) of at least one of the intercommunication networks is designed, using program and/or circuit technology, both as a communication master for this intercommunication network, for its individual operation without coupling with the multi-link controller (MLC), and as a communication slave for coupling with the multi-link controller (MLC) that operates as a communication master.

16. Multi-link controller (MLC) for an electrical drive system according to one of the preceding claims, characterised by a plurality of communication components or interfaces (SI_ISR1, SI_ISR2...) respectively configured as communication masters for external networks, and a processor (DSP) that controls them.

17. Multi-link controller (MLC) according to Claim 16, characterised in that the communication interfaces (SI_ISR1, SI_ISR2...) are designed for synchronous and/or serial data transmission.

18. Multi-link controller (MLC) according to Claim 16, characterised in that the processor (DSP) is provided with a program code element or one or more software modules (DTA_DIST_MGR) for the distribution, routing of data from one communication interface to another and/or for the filtering or other processing of this data for the other communication interface and/or with one or more preferably serial interfaces for communication with a superordinate control or diagnosis device (PLC) and/or for other data input and/or output.

19. Multi-link controller according to Claim 18, characterised by one or more modules (COM_MANAGER) that regulate and/or control the communication interfaces, for communication management with these communication interfaces.

20. Multi-link controller (MLC) according to one of Claims 16 to 19, characterised by a design and/or instrument, using program and/or circuit technology, for individual parameterisation from an external master data source.

21. Multi-link controller (MLC) according to one of Claims 16 to 20, characterised by a reception storage unit for data from the and/or to the communication interfaces (SI_ISR1, SI_ISR2...).

22. Multi-link controller (MLC) according to one of Claims 16 to 20, characterised by an instrument, using program and/or circuit technology, for converting one communication protocol of a first intercommunication network into another communication protocol of a second intercommunication network.

23. Drive synchronisation control unit as nodes of an intercommunication network for an electrical drive system according to one of the preceding claims, characterised by at least one communication interface (SI_ISR) and at least one processor (DSP) that controls it and is provided with the following functional modules:

- a master axis module (VSA_MGR), designed to receive, to generate and/or route data and/or commands for a virtual master axis via the at least one communication interface (SI_ISR)
- a data distribution module (DTA_DIST_MGR), which is designed for controlling a data and/or command flow via the least one communication interface (SI_ISR) with one of the networks, in particular the intercommunication network.

24. Synchronisation control unit according to Claim 23, characterised in that the processor (DSP) is also provided with a second communication interface (SI_DRV) and a drive communication module (DRV_COM_MGR) that can be coupled with it and is designed for controlling a data and/or command flow via the second communication interface (SI_DRV) with one of the drive networks.

25. Synchronisation control unit according to Claim 24, characterised in that the master axis module (VSA_MGR) is designed for access to the two communication interfaces (SI_DRV, SI_ISR) for the purpose of bidirectional data and/or command interchange between two networks.

26. Synchronisation control unit according to Claim 24 or 25, characterised in that the processor (DSP) is also provided with a third communication interface (SI_PLC), with which the drive communication module (DRV_COM_MGR) and/or data distribution module (DTA_DIST_MGR) for organising an command and/or data flow between one of the drive and/or intercommunication networks, on the one hand, and a further network, in particular control network with asynchronous data interchange, on the other hand, can be coupled.

27. Synchronisation control unit according to Claim 26, characterised in that the drive communication module (DRV_COM_MGR) is designed for access to the second and third communication interfaces (SI_DRV, SI_PLC) for the purpose of bidirectional data and/or command interchange between two networks.

28. Synchronisation control unit according to Claim 24 or 26, characterised in that the data distribution module (DTA_DIST_MGR) is designed for access to at least two of the first, second and third communication interfaces (SI_ISR, SI_DRV, SI_PLC) for the purpose of bidirectional data and/or command interchange between at least two of the different networks.

29. Synchronisation control unit according to one of Claims 23 to 28, characterised in that the processor (DSP)

is provided with one or more modules (COM_MGM) that regulate and/or control the first, second and third communication interfaces, (SI_DRV, SI_ISR, SI_PLC), for communication management via these communication interface(s).

30. Synchronisation control unit according to one of Claims 23 to 29, characterised in that the data distribution module (DTA_DIST_MGR) comprises filtering or other processing functions for data and commands from at least one communication interface for at least one other communication interface.